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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/775,996	02/09/2004	Aldo Piacentini	02198/0200638-US0	9087
7278	7590	10/23/2006	EXAMINER	
DARBY & DARBY P.C. P. O. BOX 5257 NEW YORK, NY 10150-5257			KRISHNAN, MALINI	
			ART UNIT	PAPER NUMBER

1714

DATE MAILED: 10/23/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/775,996

Applicant(s)

PIACENTINI ET AL.

Examiner

Malini Krishnan

Art Unit

1714

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 February 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-26 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-26 is/are rejected.
- 7) ☒ Claim(s) 13 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 09 February 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☒ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 02/09/2004.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____.

DETAILED ACTION

Drawings

1. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: Reference number 1 in Figure 1. Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

2. The disclosure is objected to because of the following informalities: The term "directed" is misspelled on page 1, line 20. The phrase, "This acts catalytic..." on page 2, line 19 is not written properly with regard to English grammar rules. The term "be" is misspelled on page 5, line 19.

Appropriate correction is required.

Claim Objections

3. Claim 13 is objected to because of the following informalities: The term "about" is misplaced in the sentence. Appropriate correction is required.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:
- The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.
5. Claims 1-9 and 12-22 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The phrase "higher temperature" in line 3 of claim 1 renders the scope indefinite because applicant has not given a standard with respect to which the esterification temperature can be understood as a "higher temperature".
6. Claims 2-9 and 12-22 are indefinite because they depend on claim 1 and therefore do not avoid the confusion caused by the noted language.
7. Claims 4 and 5 recite the limitation "the oil" in line 1 of each claim. There is insufficient antecedent basis for this limitation in claim 1.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

Art Unit: 1714

A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148

USPQ 459 (1966), that are applied for establishing a background for determining

obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

10. Claims 1-6,7,8,10,12,15,17, 19, 20 and 23-25 are rejected under 35 U.S.C.

103(a) as being unpatentable over Harrison ('856) in view of Basu ('126).

11. Harrison ('856) discloses a method of producing carboxylic acid esters using catalytic esterification of carboxylic acids such as fatty acids. The fatty acids are obtained from various sources including vegetable and animal fat. Examples include vegetable oil, lard, tallow, and fish oil. Given that Col. 4, lines 49 and 50 of Harrison ('856) describe "triglycerides of vegetable origin" and "triglycerides of animal origin", it is the examiner's position that Harrison ('856) encompasses vegetable and animal fats such as those in claim 2 of the present invention. The esterification reaction occurs at elevated temperatures such as 160°C, and reduced pressure such as 100 mbar, in a column reactor which contains a plurality of esterification trays holding solid catalysts thereon, and is described as one in which a liquid phase containing the carboxylic acid

Art Unit: 1714

component flows downward counter current to an upward stream of alcohol, which can be mono-, di-, or polyhydric. Examples of alcohols include ethylene glycol (See Col. 5, lines 35-41). A liquid ester product is recovered from a bottom part of the reactor and an alcohol/water mixture is recovered from an upper part of the reactor. The recovered alcohol/water mixture can be condensed so that the condensed alcohol can re-enter the reactor (See Col. 2, line 61- Col. 3, line 27, Claim 1, 2, 6, 7). An apparatus is also described as a column tower with at least two packing beds, solid catalysts, an inlet in the upper part of the apparatus to insert the fat, an outlet in the lower part of the tower apparatus to remove the neutralized fat, an inlet in the lower part of the apparatus for insertion of alcohol so that it runs counter current through the packing bed to the fat, and an outlet in the upper part of the tower apparatus from which a mixture containing water and alcohol is removed. In passing, the examiner notes that the tower apparatus is the same as the column reactor. Furthermore, the apparatus contains a condensation device for the alcohol/water mixture so that the alcohol can be recycled to the esterification column and the water can be rejected (See Col. 9-10, Col. 6, lines 49-55, Claim 11).

With regard to the withdrawal of alcohol/water mixture from an upper part of the column, although the means for withdrawing is not specifically specified as a vacuum, Harrison ('856) does state that it should be understood that items such as vacuum pumps may be required and should be used in accordance with conventional chemical engineering practice (See Col 13, lines 48-52). It is therefore the examiner's position

Art Unit: 1714

that one of ordinary skill in the art would know to use a vacuum as a means of withdrawing the mixture from the top of the column.

Harrison ('856) does not disclose: (i) neutral catalysts (claims 1 and 23), (ii) some of the specified types of animal and vegetable fats and oils used in the esterification process of fatty acids (claims 2 and 3), (iii) a percentage of free fatty acids present in the fats and oils used (claims 5 and 6), and (iv) the fats and oils being transformed into a pumpable state and inserted into the reactor, wherein a pumpable state comprises running the fat through a coarse filter prior to entering the reactor (claims 19, 20).

With respect to (i) above, Basu ('126) describes a process for the production of esters used as diesel fuel substitutes wherein a neutral catalyst is utilized and chosen specifically to avoid formation of soaps (See Col. 3, line 1, lines 50-52).

It would have been obvious to one of ordinary skill in the art at the time of invention by applicant to combine the teachings of Harrison ('856) and Basu ('126) in order to prevent side reactions. The catalysts described are insoluble in the alcohol and therefore would not react with the fats and oils to produce unwanted soaps.

With respect to (ii) above, Basu ('126) discloses animal, poultry fats and used grease as possible feedstock for the esterification process (See Col. 3, lines 30-32). Stern ('946) discloses vegetable oils, rendered fats such as tallow and lard, fish oils, and other animal oils as possible feedstock (See Col. 5, lines 12).

It would have been obvious to combine the teachings of Harrison ('856) and Basu ('126) with that of Stern ('946) because the examples provide a variety of fats and oils that could be used to produce the fatty acid esters.

With respect to (iii) above, Basu ('126) discloses a process of producing esters from fatty acid feedstock wherein the feedstock has a free fatty acid concentration of at least 40% (Basu Claim 2). Furthermore, rendered fats such as lard and tallow are disclosed in Harrison ('856) and Basu ('126), which correspond to an acid number of 60 or above, which is interpreted to equate to 30% or more. The rendering fats can therefore be used as fats containing 5 to 75 percent per weight free fatty acid content and 15 to 40 percent per weight free fatty acid content.

It would have been obvious to one of ordinary skill in this art at the time of invention by applicant to combine the teachings of Harrison ('856) and Basu ('126) because it allows for increased efficiency in producing the desired fatty acid ester product by converting fats with a high amount of free fatty acids to product with little or no free fatty acid content.

With respect to (iv) above, Basu ('126) discloses a filtration step in the esterification process, which removes any remaining catalyst or unwanted contaminants from the ester product (See Col. 4, lines 36-37).

It would have been obvious to one of ordinary skill in this art at the time of invention by applicant to combine the teachings of Harrison ('856) and Basu ('126) in order to ensure the fats and oils going into the reactor were free of any contaminants. The filtration step described in Basu ('126) is a common technique used for removal of contaminants and it would therefore be obvious to apply a filter anywhere in the esterification process that is deemed necessary.

Art Unit: 1714

12. Claims 9, 11, and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Harrison ('856) in view of Basu ('126) as applied to claim 1 above, and further in view of Stern ('946).

The discussions of Harrison ('856) and Basu ('126) as set forth in paragraph 11 above are incorporated herein by reference.

Neither Harrison ('856) nor Basu ('126) describe: (i) the use of a stoichiometric excess of alcohol (claim 9), (ii) the esterification temperature ranging from 150°C to 220°C is not described (claim 11), and (iii) a range of 15 to 50 mbar for the vacuum in the reactor (claim 13).

With respect to (i) above, Stern ('946) describes a method for the production of esters from vegetable oils or animal fats and alcohol wherein the amount of alcohol used is in stoichiometric excess to the fats (Stern Claim 4).

It would have been obvious to one of ordinary skill in this art at the time of invention by applicant to combine the teachings of Harrison ('856), Basu ('126) and Stern ('946) in order to ensure that the equilibrium is shifted such that an overstoichiometric conversion of fats to fatty acid ester is achieved, and the desired product is obtained.

With respect to (ii) above, Stern ('946) discloses the temperature range for the esterification reaction is specified as ranging from 170°C to 250°C (Stern Claim 4).

It would have been obvious to one of ordinary skill in this art at the time of invention by applicant to combine the teachings of Harrison ('856), Basu ('126) and

Stern ('946) because the temperature range would enhance complete formation of the desired product and reduce the possibility of unwanted side reactions.

With respect to (iii) above, Stern ('946) specifies the pressure of the reactor to be less than 100 bar (Stern Claim 4).

It is evident that Stern's reactor pressure encompasses the claimed pressure of about 15-50 mbar. Although Harrison's lower limit for the pressure is 100 mbar, nevertheless it would still have been obvious to one of ordinary skill in this art at the time of invention by applicant to combine the teachings of Harrison ('856), Basu ('126) and Stern ('946) because at certain desirable pressures, such as the one disclosed by Stern ('946), the reaction will take place under a vacuum sufficient for the esterification to proceed.

13. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Harrison ('856) in view of Basu ('126) as applied to claim 1 above, and in further view of Goto ('359).

The discussions of Harrison ('856) and Basu ('126) as set forth in paragraph 11 above are incorporated herein by reference.

Neither Harrison ('856) nor Basu ('126) disclose waste fats, fats from industrial processes, horse fats and combinations thereof as possible feedstock for the esterification process.

Goto ('359) discloses examples of fats and oils including animal fats, waste fats, fat from industrial processes, vegetable oils, marine animal oils, lard, horse fat and combinations thereof (See Col. 2, lines 18-34).

It would have been obvious to one of ordinary skill in this art at the time of invention by applicant to combine the teachings of Harrison ('856) and Goto ('359) in order to provide a wider variety of possible feedstock for the production of fatty acid esters usable as diesel fuel.

14. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Harrison in view of Basu and further in view of Currie (EP/0037172) hereinafter referred to as Currie.

The discussions of Harrison ('856) and Basu ('126) as set forth in paragraph 11 above are incorporated herein by reference.

Harrison ('856) does not disclose types of neutral catalysts used in the esterification process.

Basu ('126) discloses a salt of barium as an esterification catalyst (See Col. 3, line 1). Currie discloses esterification catalysts of aluminium, antimony, lead, iron, copper, manganese, titanium and zinc (See Claims 2 and 4).

It would have been obvious to one of ordinary skill in this art at the time of invention by applicant to combine the method taught by Harrison ('856) with the methods and catalysts of Basu ('126) and Currie because the examples provide many options of catalysts that would aid the reaction without reacting with the fatty acids to produce unwanted side products.

15. Claims 16 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Harrison ('856) in view of Basu ('126) as applied to claims 1 and 23 above, and further in view of Nelson ('657).

The discussions of Harrison ('856) and Basu ('126) as set forth in paragraph 11 above are incorporated herein by reference.

Neither Harrison ('856) nor Basu ('126) describe a spiral shaped catalyst used in the reactor in a packing bed.

Nelson ('657) discloses a catalyst structure of a plurality of helically wound coils of wire arranged and connected to form a sheet of coils wherein the wire is a catalytically active material. Advantages in the use of a spiral catalyst are also disclosed as improvements on exposed surface area and resistance to fluid flow (See Col. 1, lines 13-21, 28-36, 44-50, 63-68, Figs. 1-5). The claimed spiral shape is interpreted to be the same as the coiled shape.

It would have been obvious to one of ordinary skill in this art at the time of invention by applicant to combine the teachings of Harrison ('856), Basu ('126) and Nelson ('657) in order to enhance the catalysis of the fatty acids and alcohol. The advantages of the shape of catalyst disclosed by Nelson ('657) will allow for increased efficiency of obtaining the fatty acid ester product.

16. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Harrison ('856) in view of Basu ('126) as applied to claim 1 above, and further in view of Wollmann ('125).

The discussions of Harrison ('856) and Basu ('126) as set forth in paragraph 11 above are incorporated herein by reference.

Neither Harrison ('856) nor Basu ('126) disclose a washing step of the esterification product with an aqueous organic acid in an amount ranging from about 0.05 to 0.5 percent aqueous citric acid solution.

Wollmann ('125) discloses a method of producing sterols from fatty acid production residues wherein an intermediate step consists of an esterification reaction of fatty acids contained in fats and oils with a mono- or polyhydric alcohol on a fixed catalytic bed. An aqueous citric acid solution is used on the products of the esterification reaction in order to dispose of possible esterification catalysts still contained in the product (See Col. 4, lines 60-67).

It would have been obvious to one of ordinary skill in this art at the time of invention by applicant to combine the methods taught by Harrison ('856) and Basu ('126) with the washing step of Wollmann ('125) in order to ensure the product does not contain any contaminants or unwanted substances. Washing with an aqueous citric acid solution would convert the contaminants to compounds insoluble with the product, thereby allowing precipitation from the product. It is the examiner's position that the specified range of percent aqueous citric acid solution is a results effective variable because changing the range would clearly affect the success of the wash. See MPEP § 2144.05 (B). Case law holds that "discovery of an optimum value of a result effective variable in a known process is ordinarily within the skill of the art." See *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). Therefore, it would have been obvious to one of ordinary skill in the art to choose this range in order to obtain the desired end result.

Art Unit: 1714

17. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Harrison ('856) in view of Basu ('126) as applied to claim 1 above.

The discussion of Harrison ('856) as set forth in paragraph 10 above is incorporated herein by reference.

Harrison ('856) does not describe a method wherein neutralized vegetable and/or animal fat is directed into a power plant.

Noting that the claimed "neutralized vegetable and/or animal fat" is interpreted to be the fatty acid ester product obtained through the invention, attention is drawn to Basu ('126), which discloses a method of producing fatty acid esters that can be used as a diesel fuel substitute (See Col. 4, lines 62-65).

It would have been obvious to one of ordinary skill in this art at the time of invention by applicant to combine the methods taught by Harrison ('856) and Basu ('126) in order to provide a useful purpose for the fatty acid ester product. It is the examiners position that as a diesel fuel substitute, the fatty acid ester product would therefore be usable in a diesel engine.

18. Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Harrison ('856) in view of Basu ('126) as applied to claim 21 above, and further in view of Lyons ('697).

The discussions of Harrison ('856) and Basu ('126) as set forth in paragraphs 11 and 16 above are incorporated herein by reference.

Neither Harrison ('856) nor Basu ('126) describe heat produced by operating the power plant being used for heating the reactor and pre-heating the vegetable or animal fat.

Lyons ('697) discloses a known cogeneration system wherein the mechanical output of an internal combustion engine is coupled to a generator that produces an electrical output, and the heat output of the internal combustion engine is coupled to a thermal load, capturing the otherwise wasted heat so that means for reuse can be applied (See Col. 4, lines 4-15).

It would have been obvious to one of ordinary skill in this art at the time of invention by applicant to combine the teachings of Harrison ('856) and Basu ('126) with that of Lyons ('697) in order to reuse the heat generated by the diesel engine towards a productive means. By using a cogeneration system, heat released is not lost and can be recycled for various uses, one of which can be to heat the reactor and pre-heat the vegetable or animal fat. This would be an efficient means of recycling the heat released since heating the reactor and pre-heating the vegetable or animal fat are necessary steps in the esterification process, and therefore is an obvious use of the captured heat from the cogeneration system.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Malini Krishnan whose telephone number is 571-272-6519. The examiner can normally be reached on Monday through Friday, 8:00 am - 5:00 pm, EST.

Art Unit: 1714

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vasu Jagannathan can be reached on 571-272-1119. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

2006/10/13

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